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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
STOUFFER, KELLY M	
ART UNIT	PAPER NUMBER
1762	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/03/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/771,331	MASSLER ET AL.	
	Examiner	Art Unit	
	Kelly Stouffer	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 March 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *43-50,52-59 and 61-76* is/are pending in the application.

4a) Of the above claim(s) *62-76* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *43-50,52-59 and 61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *6 March 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/10/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, filed 6 March 2007, with respect to the objections of the specification, drawings, and claims have been fully considered and are persuasive. The objections of the specification, drawings, and claims have been withdrawn.

2. Applicant's arguments, filed 6 March 2007, with respect to the 35 USC 112 2nd paragraph rejection have been fully considered and are persuasive. The 35 USC 112 2nd paragraph rejection of claims 43-50, 52, 55, 58-59 and 61 has been withdrawn. Applicant's arguments filed 6 March 2007 with respect to the combination of references in the 35 USC 103(a) rejections have been fully considered but they are not persuasive. The applicant argues that the newly amended claims re quire a combination of references that would not constitute a proper *prima facie* case of obviousness, especially with the Ichimura et al. reference. The applicant additionally argues that the references of the previous office action do not contain the claimed frequency range. However, Hashimoto et al. teaches applying a sinusoidal substrate bias voltage in the claimed frequency range in order to reduce damage to the film or the substrate during plasma processing (column 13 lines 8-48). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the references as presented below to include a sinusoidal substrate bias voltage in the medium frequency range of 10-10000 kHz as taught by Hashimoto et al. in order to reduce damage to the film or the

substrate during plasma processing. As to the Ichimura et al. reference, Ichimura et al. teaches the longitudinal magnetic field used during deposition that varies with respect to space (abstract). The magnetic field of Ichimura et al. has several advantages over the prior art including resonating with a high efficiency (column 2 lines 60-65), reducing magnet size and therefore favorably effecting cost (column 2 lines 65-68), suppressing spatial variations of absorption (column 3 lines 5-15), and confining the plasma with a high energy (column 3 lines 45-50). It would have been obvious to one of ordinary skill in the art to modify the prior art below to include a longitudinal magnetic field used during deposition that varies with respect to space as taught by Ichimura in order to create a magnetic filed that will resonate with a high efficiency, reduce magnet size and therefore favorably effect cost, suppress spatial variations of absorption, and confine the plasma with a high energy.

Therefore, in view of the amendments, new grounds of rejection are presented below for the claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 43-46, 49, 52-59 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent number 5645900 to Ong et al. in view of US Patent number 6558471 to Neerinck et al., US Patent number 5779925 to Hashimoto et al., and US Patent number 6332947 to Ichimura et al.

Regarding claim 43, Ong et al. includes a process for producing a layer system for the protection against wear and corrosion and improving the sliding properties

(column 1 et seq. and column 2 lines 1-19 and column 5 lines 25-28) having an adhesive layer on the substrate, a transition layer for the arrangement on the adhesive layer and a cover layer of diamond-like (adamantine) carbon (see Figures 1 and 2 and column 3 lines 48-66). The process comprises charging the substrate into a vacuum chamber and pumping down to a vacuum of a pressure of less than 10^{-4} mbar or $5.7x10^{-5}$ torr (column 6 lines 15-35), plasma-aided vapor depositing of the adhesive layer on the substrate (Figure 4), applying the transition layer to the adhesion layer by the simultaneous plasma-aided vapor depositing of the adhesion layer constituents and depositing carbon from the gas phase (Figure 4 and columns 2 and 3 lines 20-8), applying the adamantine carbon layer on the transition layer by a plasma-aided depositing of carbon from the gas phase (Figure 4 and column 6 lines 44-52), applying a bias voltage to the substrate, and a magnetic field to the plasma to stabilize it (reduces heating effects caused by electrons and neutralizes charges in the plasma, see columns 5 and 6 lines 60-57). Ong et al. does not include cleaning the substrate before depositing the adhesive layer. Neerinck et al. teaches a reactive ion-etching step before depositing similar layers to activate the substrate surface and remove residual oxides (column 5 lines 30-35).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ong et al. to include a cleaning step before deposition as taught by Neerinck et al. in order to activate the substrate surface and remove residual oxides.

Ong and Neerinck et al. do not include a sinusoidal substrate bias voltage in the medium frequency range of 10-10000 kHz. Hashimoto et al. teaches applying a

sinusoidal substrate bias voltage in the claimed frequency range in order to reduce damage to the film or the substrate during plasma processing (column 13 lines 8-48).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ong and Neerinck et al. to include a sinusoidal substrate bias voltage in the medium frequency range of 10-10000 kHz as taught by Hashimoto et al. in order to reduce damage to the film or the substrate during plasma processing.

Ong, Neerinck, and Hashimoto do not include the longitudinal magnetic field used during deposition that varies with respect to space. Ichimura et al. teaches the longitudinal magnetic field used during deposition that varies with respect to space (abstract). The magnetic field of Ichimura et al. has several advantages over the prior art including resonating with a high efficiency (column 2 lines 60-65), reducing magnet size and therefore favorably effecting cost (column 2 lines 65-68), suppressing spatial variations of absorption (column 3 lines 5-15), and confining the plasma with a high energy (column 3 lines 45-50).

It would have been obvious to one of ordinary skill in the art to modify Ong, Neerinck, and Hashimoto to include a longitudinal magnetic field used during deposition that varies with respect to space as taught by Ichimura in order to create a magnetic filed that will resonate with a high efficiency, reduce magnet size and therefore favorably effect cost, suppress spatial variations of absorption, and confine the plasma with a high energy.

Regarding claim 44, the cleaning of Neerinck et al. includes ion-etching (column 5 lines 30-35).

Ong, Neerinck, and Hashimoto include the provisions of claims 45 and 46 except for heating the substrate by electron bombardment that takes place using a low-voltage arc and the simultaneous application of an AC bias voltage to the substrate. Ichimura et al. teaches using an AC superimposed bias voltage on the substrate during plasma deposition that would cause electron bombardment during coating, etching etc. in column 5 lines 55-65 (where one of ordinary skill in the art would recognize that during etching or sputtering a substrate using plasma one would clean the surface of the substrate and raise its temperature) in order to have a good substrate anisotropy (column 9 lines 57-67) and increase process efficiency (column 4 lines 41-58). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ong, Neerinck, and Hashimoto to heat the substrate by electron bombardment that takes place using a low-voltage arc and the simultaneous application of an AC bias voltage to the substrate as taught by Ichimura et al. in order to have a good substrate anisotropy and increase process efficiency.

Regarding claim 49, deposition of the adhesive layer takes place by plasma CVD process (column 2 of Ong et al. lines 45-49).

Regarding claims 52 and 56, Neerinck et al. discloses using argon with a precursor to ignite the plasma (column 2 lines 58-67).

Regarding claims 53 and 54, Ong et al. shows the components of the transition layer in Figure 3 and discusses the formation of the transition layer, including increasing carbon in the second half of the layer in steps in column 3 lines 48-65.

Regarding claim 55, Neerinck et al. discloses using carbon-containing gas to deposit carbon from the gas phase in plasma aided CVD (column 3 lines 17-25).

Regarding claim 57, Ong et al. discloses changing carbon and argon gas pressures in column 6 line 58- column 7 et seq. One of ordinary skill in the art would recognize that if the fraction of carbon gas is increased, the related fraction of argon gas inherently decreases.

Regarding claims 58-59, Hashimoto et al. teaches applying a sinusoidal substrate bias voltage in the claimed frequency range in order to reduce damage to the film or the substrate during plasma processing (column 13 lines 8-48).

Regarding claim 61, Ong et al. discloses pressures in the claimed range in column 6 lines 15-35.

4. Claims 47-48 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ong et al., Neerinck et al., Hashimoto et al. and Ichimura et al. as applied above, and further in view of US Patent number 5431963 to Rzad et al.

Ong et al., Neerinck et al., Hashimoto et al. and Ichimura et al. are described above and include the provisions of claims 47-48 and 50 except for using Ar and He as the plasma gas during etching and a negative substrate bias voltage during etching and

deposition of a film. Rzad et al. teaches using Ar and/or He depending on the substrate used (column 2 lines 62-66) to improve film adhesion on the substrate and receive varied desired effects in the future film (column 5 lines 30-45).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ong et al., Neerinck et al., Hashimoto et al. and Ichimura et al. to include using Ar and He as the plasma gas during etching and a negative substrate bias voltage during etching and deposition of a film as taught by Rzad et al. in order to improve film adhesion on the substrate and receive varied desired effects in the future film.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

kms

TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER